

REMARKS

Claims 2 through 10 remain in the application with claim 1 being cancelled. New claims 11-14 are added to better distinctly claim and point out that which the applicants regard as their invention.

These amendments are believed not to introduce new matter, and entry of the Amendment is respectfully requested.

Claim Rejections ┌ 35 USC §103

Claims 1 - 10 are rejected under 35 USC §103(a) as being unpatentable over U.S. Patent No. 1,650,103 (Watchorn) or U.S. Patent No. 3,565,190 (Ishii) or U.S. Patent No. 5,516,237 (Hebant) or Canadian Document (CA 967770) or British Document (GB 2,344,750) or Japanese Documents (7-42469, 08082186, and 2001-3363) in view of U.S. Patent No. 4,908,101 (Frisk et al). The Examiner takes the position that all of the references except Frisk et al disclose a casing and auger which are rotated in opposite directions. The Examiner also says that, although none of the primary references teach an auger helix having increased surface roughness in the feed direction, Frisk et al does teach such a concept.

Claim 1 has been cancelled and replaced by independent claim 11 which more clearly defines the invention.

The subject matter of claim 11 relates to a device for producing tubed, bored piles. In the process of producing the piles, a tubing surrounding an inner auger are simultaneously essentially vertically introduced into the ground in a rotary boring procedure. To facilitate

material discharge, the surface roughness of the auger helix surface pointing in the feed direction is increased compared to the roughness of the rolled surfaces in a complete or partial surface manner by additional machining, and the increase in the surface roughness extends at least over a portion of the auger length necessary for feed purposes.

The applicants agree with the Examiner that the primary references only teach an auger and outer tubing arrangement. The closest prior art document mentioned by the Examiner is Frisk et al, which relates to a method and an apparatus for mixing chemicals in solid or liquid state into substances having a dry content that usually increases to about six percent.

The method is particularly adapted for mixing chemicals into lignocellulose materials such as chemical pulp, chemical mechanical pulp and mechanical wood pulp.

Frisk et al discloses a transport screw consisting of a tube shaft and a worm provided with substantially tangentially or radially directed rods or bars having semi-oval cross section. The function of the rods and bars is not described.

Contrary to Frisk et al, which deals with the problem of rapid and homogeneous mixing of chemicals, the problem addressed in the present invention is to ensure removal of blockages in the auger and to ensure the delivery of soil with reduced force expended during a boring procedure.

The feeding and delivery of material is especially difficult in the case of loose soils with layers of cohesive soil material. The cohesive soil becomes stuck in the auger, forms a plug and the material flow within the tubing is no longer ensured, so that the auger rotates in place without delivering material upwards.

Another problem dealt in the invention, arises on boring in coarse-grain soils. In such a case, the material to be fed can jam between the auger and the inner wall of the tubing so that it becomes very difficult for the auger to turn in the interior of the tubing. As a result, only a small amount of soil is delivered and the boring tool can only penetrate the soil very slowly.

The aforementioned difficulties arise in particular with smooth helix surfaces formed from conventional rolled plates. The turning or rotation of the auger in the interior of the tubing is very difficult and auger blockages may occur on encountering cohesive soil layers.

Cohesive soils adhere to a greater or lesser extent to the auger helix surface as a function of adhesion. In order to be able to vertically feed soil material by means of an auger with encasing tubing, it is necessary for the frictional force between the soil and the steel surface of the auger helix to be lower than the frictional force on the tube jacket.

Therefore, the principle of the present invention as provided for in claim 11 is based on the fact that the roughness of the surface of the auger helix is increased compared with the roughness of the rolled plates and the increased surface roughness occurs over the entire auger length necessary for delivering soil. This increase in the surface roughness has different effects.

As a result of the higher surface roughness of the helix surface, the contact space between soil and helix is smaller with cohesive soils.

Contact takes place in punctiform manner or at least in small area form. Therefore, the adhesion forces between soil and the helix surface are much lower than the smooth helix surface. This avoids blockages on the auger and continuous feed or delivery is possible. As a result of the changed surface characteristics, there is also a clear improvement in the delivery in the case

of loose soil. The auger rotates much more easily in the tube, and the soil to be delivered can be brought upwards more easily and rapidly.

It is clear, due to the direction of gravity, that the advantageous effects can only occur in combination with a vertical feed direction. Therefore, Frisk et al describing a horizontal extrusion apparatus can provide no teaching or suggestion to arrive at the claimed invention, because the aforementioned difficulties do not appear.

Thus it is respectfully submitted that claim 11 may not be rejected under 35 USC § 103 as being unpatentable based on the several references applied by the Examiner for the reasons specified above. Further it is respectfully submitted that none of the cited references taken alone or in combination anticipate or make obvious that which the applicants regard as their invention.

Claim 2 - 10 and 12 - 14 can trace their dependence to claim 11 and as such incorporate all of the limitations of that claim. For at least these reasons, claims 2 - 10 and 12 - 14 may not be rejected under 35 USC § 103 as being unpatentable based on the several references applied by the Examiner for the reasons specified above. Further it is respectfully submitted that none of the cited references taken alone or in combination anticipate or make obvious that which the applicants regard as their invention as provided for in claims 2 - 10 and 12 - 14..

Conclusion

Thus, it now appears that the application is in condition for allowance. Should the Examiner have any questions after reviewing this Amendment and Response, he is cordially

Conclusion



Thus, it now appears that the application is in condition for allowance. Should the Examiner have any questions after reviewing this Amendment and Response, he is cordially invited to call the undersigned attorney so that this case may receive an early notice of allowance.

Favorable consideration and allowance are earnestly solicited.

Respectfully submitted,

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